Session III Agenda

- Stakeholder Process Update
  - Comments and feedback received from Session II Homework and Session III agenda
  - Updates made to the Transmission Impact Analysis responsive to Stakeholder feedback
  - Plan to proceed with PLEXOS and changes made to intervenor license responsive to Stakeholder feedback
- Retirement Analysis Update
  - Update on timeline and expected process for the retirement analysis
  - Review details of Transmission Impact Analysis and how scenarios bookend options for DESC
  - Discuss proposed guidelines for the Retirement Study with Stakeholders

<15 min break>

- 2021 IRP Update Process Update
  - Review of final order on 2020 Modified IRP and timeline to the 2021 IRP Update
  - Requirements for 2021 IRP Update from the final order and preceding orders
- 2021 IRP Update Inputs & Assumptions
  - New Portfolio Concepts (the low carbon portfolio, near term solar and storage, the "CT Plan")
  - Solar ELCC
  - Portfolio Selection Criteria
  - Risk Metrics
  - Reliability Factors

<45 min break>

- 2021 IRP Update Inputs & Assumptions (continued)
  - LCSE
  - Marginal line losses
  - Load Forecasts, EE integration
- Homework for Session IV and Next Steps

DESC IRP Stakeholder Advisory Group Meeting #3

I. Meeting Agenda and Introductions

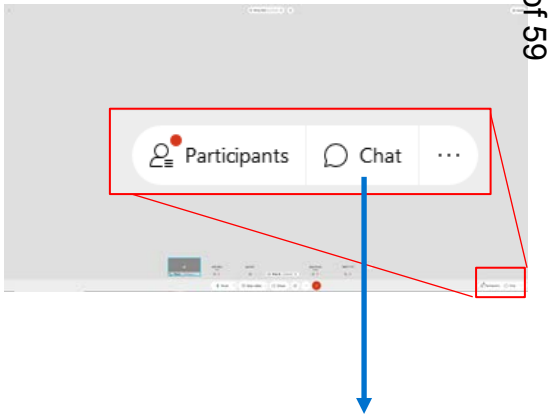
I. Introductions

- Welcome
- Comments and feedback received from Session II Homework and Session III agenda
- Updates made to the Transmission Impact Analysis responsive to Stakeholder feedback
- Plan to proceed with PLEXOS and changes made to intervenor license responsive to Stakeholder feedback
- *Discussion*

Q&A

- Microphones will be muted during presentations; we will open them when addressing questions at end of each section
- During presentations, questions can be submitted via the chat function
  - Only questions submitted in writing will be answered during live Working Group Sessions
- Each questioner will be allowed one follow-up question before they yield the floor to the next questioner
  - Please don't ask multiple questions in one question
  - If time permits and all questioners are answered, we will come back for additional questions
- All Q&As will be responded to in writing and placed on the web page:
  - https://www.DESC-IRP-Stakeholder-Group.com

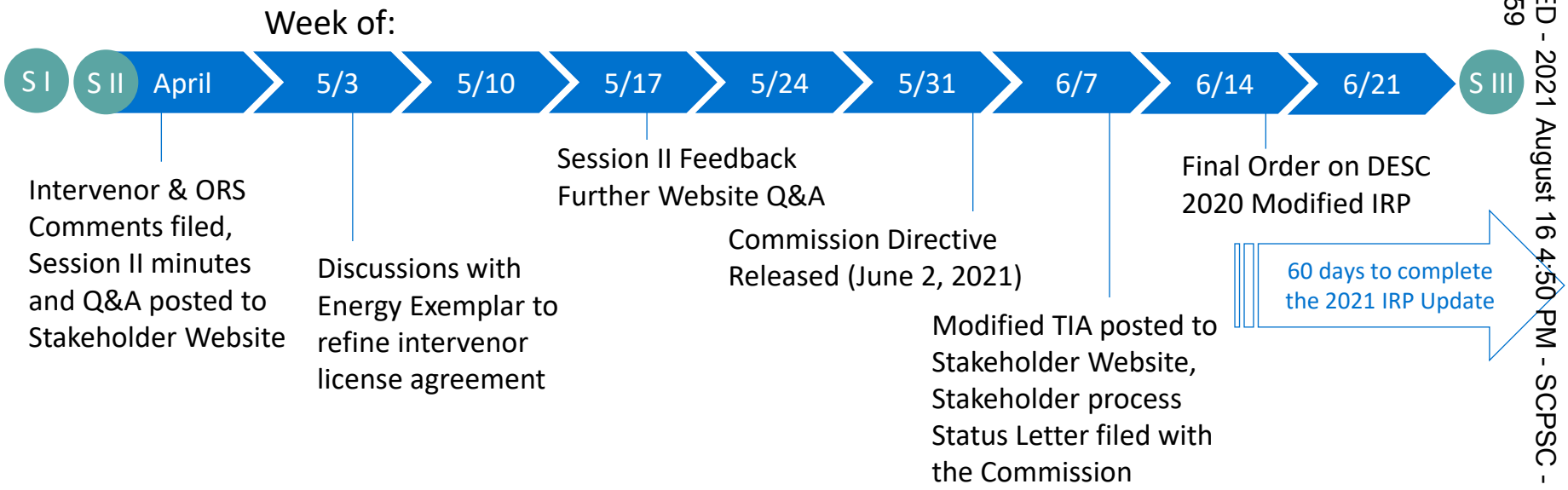
Look for the chat function in the bottom right hand corner of the WebEx screen



Please type questions into the group chat

Where are we in the process?

- A Commission decision on the 2020 Modified IRP was issued on June 18th and set a 60-day deadline for DESC's 2021 IRP Update
- DESC convened Session III after this filing so that those comments and feedback can be discussed with Stakeholders
- Session III content will focus on the Coal Retirement Analysis and the 2021 IRP Update



Stakeholders have provided comments on IRP Advisory Group in the Main IRP docket and through Stakeholder Process Feedback

Comments filed in IRP Docket (2019-226-E)

- Stakeholders filed Joint Comments in the main IRP docket in late April after Session II of the DESC IRP Advisory Group
- Stakeholders provided feedback related to the process itself and around the key topics covered in this process, including the retirement analysis and selection of the capacity expansion model

Stakeholder Advisory Process Feedback

- Many Stakeholders provided direct response to the questions on a variety of topics as part of the Session II "Homework"
- Other Stakeholders posed questions to DESC via the Stakeholder website about the timing of the retirement analysis and energy efficiency programs and targets
  - The full Q&A can be seen on the DESC website: www.desc-irp-stakeholder-group.com/FAQ

Select Intervenor Comments on DESC's Modified IRP (April 2021)

Topic	Intervenor Comments on IRP Advisory Group Topics	Response / Action Taken
Stakeholder Process	1. DESC has enhanced transparency through this stakeholder process. 2. DESC should be required to work with the Advisory Group on load forecast and EE profile inconsistencies. 3. DESC should continue to explore risk metrics with stakeholders	1. Thank you 2. The Advisory Group will address EE implementation in the IRP 3. Risk Metrics are included in the Session III Agenda
Retirement Analysis	1. DESC did not model near-term solar + storage additions combined with early coal retirements. The preferred plan (RP8) retires coal units early, but these early-retirements are replaced by natural gas units. 2. DESC lacked transparency with its intentions to implement its CT plan and the IRP doesn't allow the PSC to evaluate the "impacts of new peaker(s)".	1. New Portfolio Concepts are included in the Session III Agenda 2. Discussion of the CT Plan in included in the Session III content
Capacity Expansion Model Selection	1. DESC and CRA have been "receptive to feedback" in the Sessions I and II, but it is unclear whether "feedback will be incorporated to selecting a capacity expansion model, or simply noted." 2. Stakeholders have remaining concerns about the PLEXOS intervenor license and transparency of the model that have not yet been fully addressed.	1. Thank you, DESC incorporated Stakeholder criteria into the analysis and made changes to the intervenor license responsive to Stakeholder comments 2. DESC has worked with Energy Exemplar to address concerns raised by Stakeholders

Stakeholder feedback was requested during Session II

DESC requested the following responses at the last Advisory Group meeting:

1. Review advisory group minutes and provide comments
2. Topical Feedback: What other issues should be addressed in Session III?
3. Model Evaluation Feedback: Did we achieve consensus that PLEXOS performs all required functions?
4. 2021 IRP Inputs: Is the DESC approach consistent with the order, are there any gaps?
5. Risk Metrics Feedback: What metrics, in addition to Mini-Max, should DESC evaluate with the expected outputs?
6. Retirement Analysis: What other considerations should DESC study in addition to transmission impacts?
7. Solar Winter Capacity: Does DESC approach to measuring solar winter capacity contribution to the IRP make sense? What other approach or value would you recommend that DESC should adopt?

1. Review advisory group minutes and provide comments

Stakeholder Comments	Action Taken
Stakeholders provided no recommended changes to the meeting minutes for Session I or Session II	No changes made to files posted at: www.desc-irp-stakeholder-group.com/Meeting-Presentation-and-Materials

2. Advisory Group Feedback on Meeting III Agenda

Topic	Stakeholder Comments	Response / Action Taken
Topics Requested for Session III	• Timeline for coal plant retirement studies • Energy efficiency modeling in the 2021 IRP Update	Both of these topics are included in the Session III agenda
Topics Requested for any future Session (III+)	• The solar flexibility analysis provided by witness Sercy and whether DESC's modeling approach results in decreased value for solar units • System reliability metrics, and DESC's approach to developing rankings • Scenario development in future IRPs, and the possibility of including scenarios proposed by Stakeholders • How dispatchability and operational control of inverter-based resources will be reflected in the new resource options available in the DESC IRP	Solar ELCC and Reliability Factors are included in the Session III agenda. Future Advisory Group Sessions will address scenario development and modeling of dispatchable solar units
Topics Requested outside Advisory Group Scope	• Potential benefits of modeling a coal retirement securitization scenario to inform public policy considerations	Allowing securitization of coal retirement costs would require a legislative change and the purpose of this Advisory Group is to inform the approach and inputs to DESC's IRP

3. Model Evaluation Feedback: was consensus achieved on PLEXOS?

- Through Session II discussion and feedback, DESC heard support for PLEXOS from one Stakeholder and no Stakeholders responded with objections to PLEXOS' technical capability. However, concerns remained that the terms of intervenor license offered by Energy Exemplar could potentially restrict Stakeholder review of future DESC IRPs.

Stakeholders provided the following feedback:

1. The intervenor license stated that it may be used for "the purpose of reviewing or analyzing the electric price or power cost forecasts" which would exclude its use for IRP purposes.
2. The license states that no support or training are covered, and that a fee of $2,500 per day, this seems inconsistent with the provision of unlimited training and support encompassed in the $8,000 fee.
3. The agreement would seem to restrict use of the licensee to an employee of the Intervenor, and a consultant to the Intervenor would not be able to use it.
4. The agreement is written as if someone other than DESC is paying for the license fee .
5. The agreement prevents more than one employee from using the license, Consumers is providing a two-seat license and Energy Exemplar should do the same here.
6. The agreement limits the duration of the license to 12 months, and the current IRP has gone on for more than 12 months, this provision could potentially restrict use of the license during longer proceedings.

3. Model Evaluation Feedback: changes to the intervenor license

- DESC worked closely with Energy Exemplar to develop a modified version of the intervenor license that addressed the concerns raised by Stakeholders during Session II and through the written feedback.

DESC made changes responsive to Stakeholder feedback:

1. The intervenor license now clearly states that the scope includes the evaluative data or information needed to accurately access the DESC IRP, and that Stakeholders will have the same version of PLEXOS that DESC uses.
2. The intervenor license includes unlimited online training and access to the solver at no cost to the intervenor. Intervenors may purchase additional live training from Energy Exemplar if desired.
3. The intervenor license allows for Stakeholders to collaborate with their consultants, and have their consultants serve as the operators of PLEXOS when reviewing the DESC IRP.
4. The intervenor license allows for 1 seat with access to the solver and unlimited online training at no cost to the Intervenor and the terms have been updated accordingly.
5. The first seat with unlimited online training is provided at no cost to Intervenors. Intervenors may purchase additional seats from Energy Exemplar if more users are desired.
6. The default duration of the license agreement was increased from 12 to 24 months to allow for longer IRP proceedings and can be further extended if needed.

4. 2021 IRP Update: Is DESC's approach consistent with the Order?

- No Stakeholders recommended changes to DESC's 2021 IRP Update approach as part of the Stakeholder feedback, and one responded that the proposed approach was consistent with the order.

Stakeholders proposed some changes to the 2021 IRP Update in their April Joint Comments:

- Adjust reliability factors to better represent inverter technology by using more quantitative metrics
- Apply the minimax regrets and cost range analyses to quantify NPV and fuel costs of resource plans
- Include DSM and EE as a potential resource options rather than as a sensitivity
- Conduct additional modeling that combines early coal retirement resource plans with near-term deployment of solar and storage resources
- Disclose any changes to the modeling, other methods, or sources of data from which it derives its planning assumptions. Any changes should allow for public comment and/or intervenor testimony or comments
- Comply with DSM / EE recommendations and calculate savings as a percentage of total retail sales, employ LCSE consistent with industry estimates, use marginal line losses in calculating avoided costs, and present realistic and levelized DSM costs

5. Risk Metric Feedback: proposed metrics beyond Mini-Max

- Stakeholders provided additional comments on the application of Mini-max and importance of evaluating the range of NPV results, but did not suggest any new risk metrics for adoption by DESC.
- Stakeholders also noted that DESC should consider weather risk when selecting the preferred plan.*

Stakeholder Comments	Action Taken
There is a need to discuss proper calculation and application of minimax and cost range analyses. DESC takes an “average ranking” approach to quantify the NPV and fuel costs of resource plans.	Discussion of Risk Metrics is included in the Session III Agenda.

* This feedback was not included on the original slide but received from Stakeholders as noted during the closing Session III discussion.

6. Retirement Analysis: What key considerations should DESC study?

- Stakeholders commented on the retirement analysis through homework responses and the Stakeholder website.

Stakeholder Homework Responses	Action Taken
A Stakeholder specifically noted that there is a "need to evaluate overall system reliability impacts" of early coal retirements, in addition to evaluating transmission impacts.	• Retirement Analysis is on the agenda for Session III and Stakeholders will have an opportunity to provide additional detail on the reliability impacts that DESC should consider.

Stakeholder Website Responses	Response
Stakeholders questioned the lengthy timeline of coal retirement studies. Additionally, they asked how the schedule aligns with the selection of an ELG plan for each coal plant and how DESC plans to avoid committing to unnecessary ELG upgrade costs.	• A Retirement Study involves the coordinated effort of multiple functions within DESC. Resource planning, transmission, generation planning, and environmental departments are all involved, each with substantial responsibilities. • DESC is required to make a regulatory filing regarding its ELG compliance plans by October 2021. DESC is undertaking the coal retirement studies prior to committing to ELG compliance project costs.

Please see www.desc-irp-stakeholder-group.com/FAQ for full questions and answers.

6. Retirement Analysis: Updates to the Transmission Impact Analysis

- DESC shared the details of the TIA during Session II, describing request to study the transmission impacts of retiring the Wateree plant in 2025 or 2028 and replace it with different resource options.
- While not addressed specifically in the homework, Stakeholders raised concerns during Session II that DESC considered and incorporated into the "Modified TIA" issued in May, and which can be found on the Stakeholder website at: www.desc-irp-stakeholder-group.com/Stakeholder-Materials

Stakeholder Comment	Response / Action Taken
• The TIA scenarios explicitly define the replacement resources to be studied under each scenario. What is the relationship between the TIA scenarios and future IRP scenarios, and will this analysis limit the resource options that DESC can consider in future IRPs? • How come DESC is only considering Wateree as part of the TIA request, and when will DESC evaluate the other units on its system for early retirement?	• The TIA is a preliminary analysis and the scenarios requested will not limit the options than can be considered in the IRP, rather they are designed to book-end the available options, including full replacement with market purchases as opposed to new units. • DESC modified the TIA request in May to include both the early retirement of Williams and Wateree in the modeled scenarios.

7. Solar Winter Capacity: what value or approach should DESC use?

- Stakeholders have not yet provided any specific guidance on the approach or value that DESC should adopt to represent the capacity value of solar resources as part of the Stakeholder feedback process.

Stakeholder Comment	Response / Action Taken
• This topic could be wrapped into a full session on resource adequacy and LOLE analysis more broadly.	• DESC will raise the possibility of a Session devoted to resource adequacy and LOLE analysis for discussion with Stakeholders as part of the closing Session III discussion.
• Additional feedback under development.	• DESC looks forward to receiving additional feedback on this topic.

Additional IRP Advisory Group Session II Feedback and Q&A

- Stakeholders also used the DESC IRP Stakeholder website Q&A function to ask DESC questions about Energy Efficiency modeling.
- DESC provided responses, noting that questions directed to the IRP Advisory Group should relate to how DSM measures will be reflected in the IRP, and that the separate DSM Advisory Group is a more appropriate forum for discussing the details of DESC's DSM analysis and underlying assumptions.

	Summary of Questions from Website	Summary of DESC's Responses
Energy Efficiency	Intervenors wondered how DESC expects to realistically reach the 1% EE target used expected measures. Intervenors also requested specifics details on the EE impacts of NEEP and HVAC measures and asked how these programs can be further prioritized.	• 4 of 10 DSM programs include direct installations. • The NEEP and HVAC programs will continue to be inputs to the IRP, but their design and planning will be managed by the DSM Advisory Group. • During the 2019 DESC DSM Potential Study, existing housing and low-income customers were identified as priorities. The current portfolio includes doubling the participation in the NEEP and increases rebates for HVAC programs.

Please see www.desc-irp-stakeholder-group.com/FAQ for full questions and answers.

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #3

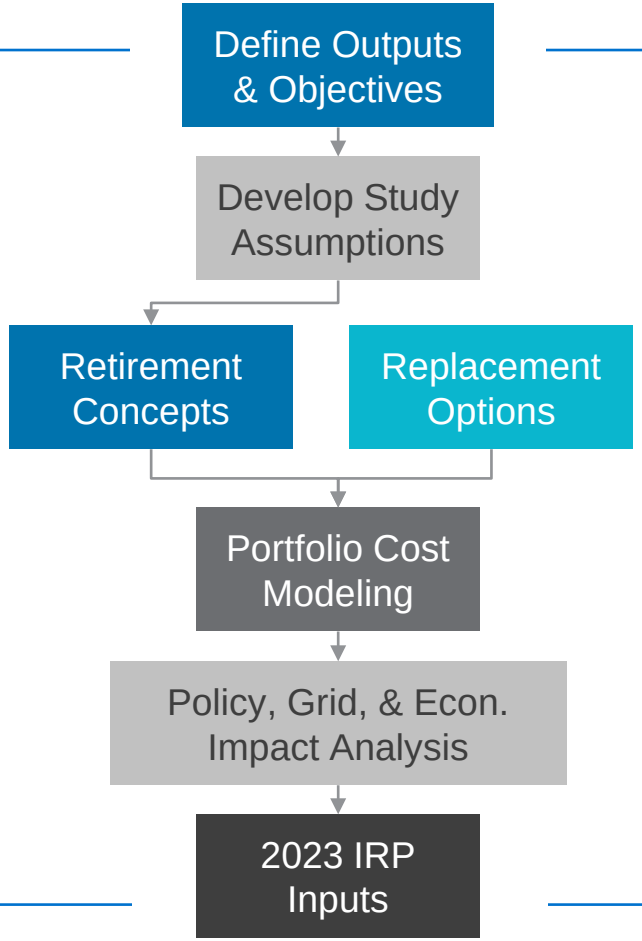
II. Retirement Analysis Update

II. Retirement Analysis Update

- Update on timeline and expected process for the retirement analysis
- CRA has been retained by DESC as an Advisor for the Retirement Study
- Review details of Transmission Impact Analysis and how scenarios bookend options for DESC
- Discuss proposed guidelines for the Retirement Study with Stakeholders
- *Discussion*

Retirement Analysis Process Overview

- The purpose of the coal retirement analysis is to evaluate how the timing of early coal retirement affects the expected impacts to DESC ratepayers, reliable system operation, and the local or state economy.
- This year-long effort aims to establish a clear retirement strategy with set dates, that will inform the full future portfolio modeling in the 2023 DESC IRP.
  - The outputs of the analysis will inform the portfolio options considered by DESC in future IRPs, beginning in 2023, along with the All Source RFP, DSM analysis, and other studies that support resource planning.
- CRA will be supporting the retirement study in an advisory role, but DESC will be responsible for developing inputs, modeling early retirements, and evaluating their impacts.
  - The Dominion team will be doing the analysis and using PLEXOS, but CRA will offer advice on overall approach, methods, and alignment with Stakeholder feedback.



Assumptions Development for the Retirement Study

The timing of the retirement analysis is driven by the need to develop detailed assumptions that reflect how early retirements will impact the operation and finances of DESC's system, including:

- Definition of market scenarios (e.g., prices and policy conditions) under which the early retirement modeling will be performed.
- Development of coal plant characteristics that drive dispatch cost (heat rate, delivered coal price, VOM).
- Evaluation of contracts for fuel, labor, and environmental reagents and quantification of liquidated damages or other costs associated with early retirement of the coal plants.
- Expected cost and timing of environmental controls needed to comply with future emissions, ELG, and CCR rules.
- Plant fixed costs, including future capital budgets for the plants assuming they continue operations or retire at various points in time.
- Expected decommissioning costs for each plant and definition of how such costs would be recovered over time.
- Current book value of the plants and expectations for cost recovery of stranded asset value (and additional options to consider, if any).
- Other financial information.
- Transmission upgrade costs or other expenditures needed for system reliability (informed by the TIA).
- Development of replacement capacity and energy options used to test retirement scenarios.
- Evaluation of state and local economic impacts of different early retirement dates.

Illustration of Retirement Concepts

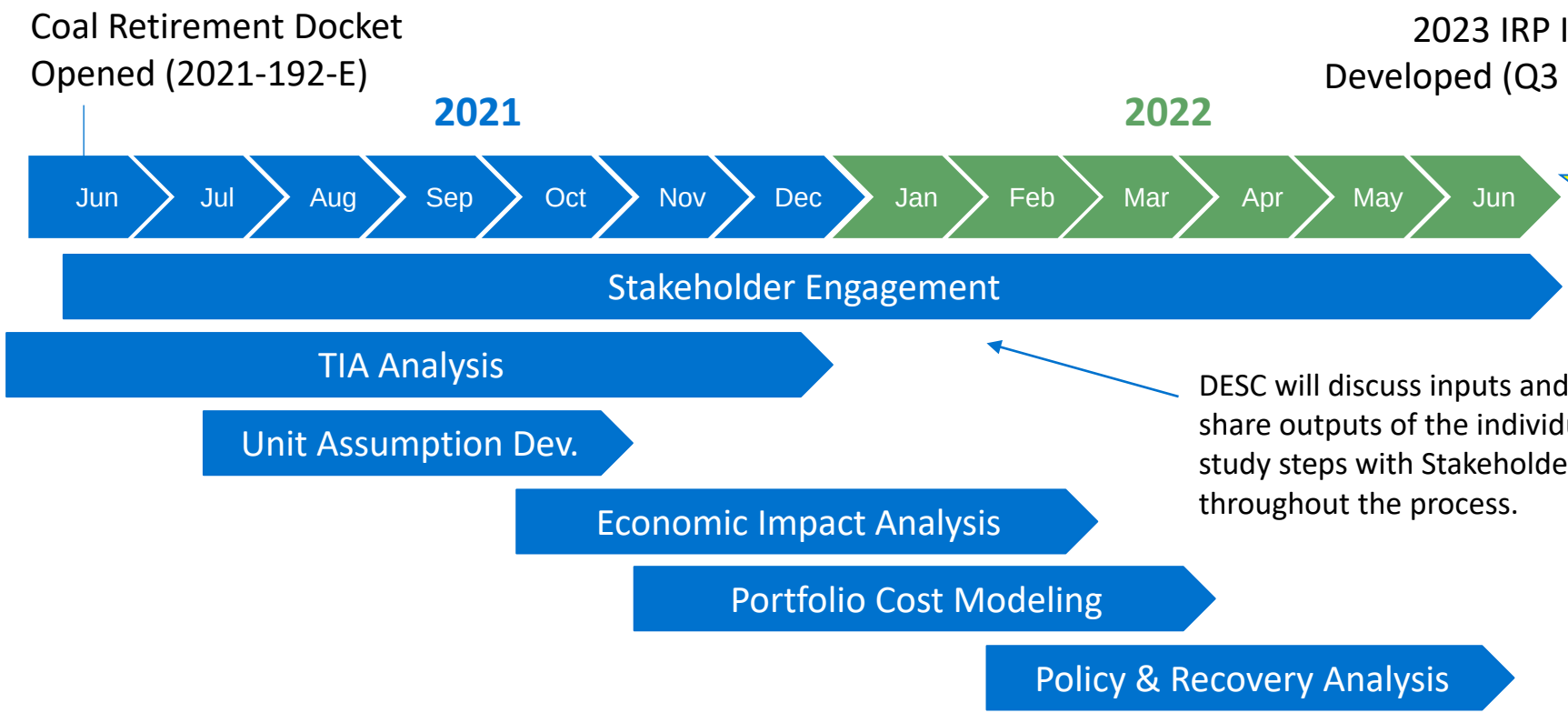
- Retirement “concepts” that test different combinations of unit retirements will be informed by these assumptions and evaluated to determine the impact of early and tested against one or more replacement options.
- The Modified TIA is evaluating 2025 and 2028 retirement dates for both units, though the Retirement Analysis may consider additional retirement schedules.

Illustration of Potential Retirement Scenarios

Plant	1 No Early Retirement	2 Earliest Possible Retirement*	3 Only Williams Retires 2028	4 Wateree and Williams 2028	5 Only Wateree Retires 2028
Wateree	Operate through end of useful life	Retire 2025	Operate through end of useful life	Retire 2028	Retire 2028
Williams	Operate through end of useful life	Retire 2028	Retire 2028	Retire 2028	Operate through end of useful life

* This date is illustrative only, these scenarios above are merely show the type of retirement scenarios that DESC will evaluate, the actual timing of these dates will be informed by the assumption development process

Retirement Analysis Outputs are Needed for the 2023 IRP



The timeline of the Retirement Analysis is subject to the procedural schedule set in the Coal Retirement docket.

Modified Transmission Impact Analysis

- The TIA is not meant to define the Retirement Study and only informs the transmission impact of the shutdown and provides some estimates of the transmission impacts for the largest replacement options. The TIA is also not an interconnection study.
- The TIA is intended to bookend the potential transmission impacts of early coal retirements under different replacement options, including replacement with solar, storage, and purchased power, to inform future IRPs.
- The Modified TIA also includes scenarios that consider early retirement of both Wateree and Williams in response to Stakeholder feedback.

- Case 1:
  - Retire Wateree in 2025
    - Add a 200 MW battery Energy Storage System (“ESS”) and 200 MW PV solar generation at Wateree
    - Contract for 200 MW off-system purchased power beginning late in 2025
  - Retire Williams in 2028
    - Build a 534 MW 1X1 CC at Jasper
    - Add a 200MW ESS and 200 MW PV solar generation at DESC’s former Canadys Station

Modified Transmission Impact Analysis

- Case 2:
  - Retire Wateree and Williams in 2028
    - Build a 534 MW 1X1 CC at Jasper
    - Build 523 MW 2X0 pair of frame CTs at Jasper

- Case 3:
  - Retire Wateree and Williams in 2028
    - Build a 534 MW 1X1 CC at DESC's former Canadys Station
    - Build 523 MW 2X0 pair of frame CTs at DESC's former Canadys Station

- Case 4:
  - Retire Wateree and Williams in 2028
  - Build a 534MW 1X1 CC at DESC's former Canadys Station
  - Add a 200 MW ESS and 200 MW PV solar generation at Wateree
  - Contract for 400 MW off-system purchased power

Modified Transmission Impact Analysis

- Case 5:
  - Retire Wateree and Williams in 2028
  - Contract for 1,100 MW off-system long-term power purchase

- All Cases:
  - Add 117 MW winter rating dual-fuel aeroderivative CTs, incrementally, as needed, at the Williams Station site to maintain system reliability or to economically overcome transmission system contingencies

Discussion: Retirement Study Guidelines

- What factors are important for DESC to consider when evaluating coal retirements?
- What elements of the study are most important and / or impactful from the perspective of the Stakeholders, what elements should DESC prioritize?

Questions, Comments? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #3

III. 2021 IRP Update Process Update

III. 2021 IRP Process Update

- Review of final order on 2020 Modified IRP and timeline to the 2021 IRP Update
- Requirements for 2021 IRP Update from the final order and preceding orders
- *Discussion*

Commission Requirements in Order No. 2021-429

- Include near term solar and storage in its 2021 IRP Update.
- Include Act 62 requirements in the 2021 IRP Update.
- Use Mr. Sercy's Minimax Regrets and Cost Range methods in addition to the "average ranking" approach.
- Provide substantive details of the CT plan in the 2021 IRP Update.
- Update reliability factors consistent with Appendix A of the Joint Comments in the 2021 IRP Update.
- Implement an All Source Procurement Plan in all future IRPs that allows independent power producers to compete with DESC Proposals. Future DESC IRPs should recommend a portfolio of resources that best meet the needs of the DESC system using actual bid data.
- Employ a reasonable levelized cost of saved energy (LCSE) in conducting its upcoming Market Potential Study and in all future IRPs starting with the 2021 IRP Update.
- Include discussion of load forecasts and the integration of Energy Efficiency impacts with its stakeholders as part of the development of the 2021 IRP Update.
- Present realistic and levelized DSM costs in all future IRPs, starting with the 2021 Update.
- Use marginal line losses in the calculation of avoided costs and in the translation of energy savings from the Market Potential Study to energy savings in all future IRPs beginning with the 2021 IRP Update.
- Use "cost effective, reasonable and achievable" as the standard for evaluating potential for higher savings portfolios in all future IRPs beginning with the 2021 IRP Update.
- DESC shall file its 2021 IRP Update within sixty (60) days from the date of the issuance of this Order.

Updates to the Requirements Matrix Per Order No. 2021-429

Topic Areas	2020	2021	2022	2023
Natural Gas	Re-run production cost modeling using the AEO low, reference, and high gas prices		Use a "wide but plausible" range of gas price projections from a public, credible source	
DSM	Consider 1% savings in '22, '23, and '24. Conduct rapid assessment of cost-eff. and achievability. Include results and action steps to evaluate cost-eff. and ach. of DSM portfolios savings ranging from 1% to 2%		Evaluate the cost-eff. and achievability of 1.25%, 1.5%, 1.75%, and 2% savings. Consider changes to existing portfolio. Include new candidate RPs including DSM and purchased power	Incorporate potential study findings, integrate portfolios with stakeholders with incentives and best practices to achieve DSM savings
		Use "cost effective, reasonable and achievable" as standard to evaluate potential for higher savings portfolios.		
Purchased Power	Use flexible **solar PPA** cost assumpt. and model 400MW flex. Solar PPAs starting 2023 w/ 20-year prices: $34, $36, and $38.94/MWh. **Storage PPAs** - use NREL ATB's low storage costs (capital and fixed O&M)		Include additional candidate resource plans including DSM and purchased power in candidate resource plans and evaluated across multiple scenarios	
Solar PV	Assume integration costs of $0.96 / MWh for solar PV, until there's Commission-approved method to calculate it			
ICT	Use industry accepted ICT capital cost assumptions			
Request for Proposals				Develop All Source Procurement Plan; use actual bid data to recommend resource portfolio.
CO_2 Prices	Re-run production cost model using AEO High CO_2		Use "wide but plausible" L/M/H CO_2 cost projections from AEO	
Peaking reserve margins			Include resource plans to meet full peaking reserve margin. Find what resources best meet the peaking increment	
Risk-adjusted metrics		Apply Minimax regrets and cost range analysis and plan selection criteria per Order 2020-832. Use Mr. Sercy's Minimax and Cost Range methods, and "average ranking"		
			Consider, with stakeholder input, more sophisticated risk-adjusted metrics (natural gas price, carbon price, and load forecast risk)	
Coal Retirement			Incorporate the conclusions from the comprehensive coal retirement analysis called for in this Order	
Action Plans	3-year action plan with steps to implement the IRP. Provide substantive detail of CT Plan.			

Dominion Energy

- Red text indicates an update to the requirements from Order No. 2020-832

Updates to the Requirements Matrix Per Order No. 2021-429

Topic Areas	2020	2021	2022	2023
Modeling Software			Implement capacity expansion software with input from stakeholders. Avail inputs and outputs, assumptions, post-processing, and the model manual	
Required Resource Plans		Include plans for meeting capacity needs with cost estimates for all portfolios, evaluate diversity of supply to meet obligations. Evaluate near term solar and storage.	Consider diversity of gen. supply, and propose candidate resource plans designed to diversify. Include "contribution to diversity" in evaluation.	
	Include more candidate resource plans that deploy renewables (RP7-A and RP7-B). In 2021, keep quantitative risk metrics from 2020 and update to latest data. **DESC may add at least one additional lower carbon option to the 2021 IRP Update.**			
ITC Assumptions	Storage PPAs use the same 22% ITC safe harbor assumptions employed for PV PPAs			
Resource Cost Assumptions		Employ a "reasonable" LCSE in Market Potential Studies. Use marginal line losses to calculate avoided costs and in the translation of energy savings from the Market Potential Study to energy savings.		
	Two different escalation rates implemented incorrectly - correct the error			
Resource Performance Assumptions	Correct the incremental flexible solar PPA capacity value assumptions to the existing system penetration level of incremental flexible solar PV			
	Include recent generator performance data. Include storm outage reporting	Adjust reliability factors consistent with Appendix A of 4/20 Joint Comments		
Load Forecast Assumptions			Develop a wide range of load forecasts. Cost modeling capture each plan's capabilities to adapt to load that diverges from base forecast	
Stakeholder Process		Report on Stakeholders with semi-annual updates. Include load forecasts and EE impacts.	Negotiate discounted, licensing fee that permits intervenors to perform modeling. Absorb the cost	
State and Federal Regulations	More analysis how env. regulations affect generation units and resource choices			
Rate and Bill Impacts	Calculate the rate and bill impacts of portfolios, rather than just a levelized NPV of revenue requirements			

- Red text indicates an update to the requirements from Order No. 2020-832

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #3

IV. 2021 IRP Update Inputs & Assumptions

IV. 2021 IRP Update Inputs & Assumptions

- New Portfolio Concepts (the low carbon portfolio, near term solar and storage, the “CT Plan”)
- Solar ELCC
- Portfolio Selection Criteria
- Risk Metrics
- Reliability Factors
- LCSE
- Marginal line losses
- Load Forecasts, EE integration
- *Discussion*

2021 IRP Update Inputs & Assumptions

- New Portfolio Concepts
  - The low carbon portfolio:
    - In Order No. 2020-832, the Commission found that it is prudent for Dominion to add at least one additional lower carbon option to the 2021 or 2022 IRP Update for modeling incorporating additional solar and storage opportunities.
    - DESC is currently evaluating whether to include the lower carbon option in the 2021 or 2022 IRP Update.
  - Near term solar and storage:
    - In Order No. 2020-832, the Commission ordered DESC to evaluate near term solar and storage additions in conjunction with its Revised Modified 2020 IRP.
    - In response, DESC created candidate Resource Plans 7a and 7b and modeled 400 MW of Flexible Solar PPAs and storage starting in 2023 with 20-year PPA prices of $34/MWh, $36/MWh, and $38.94/MWh.
    - DESC will update these near-term solar candidate resource plans in its 2021 IRP Update per Order No. 2020-832.
  - The “CT Plan”
    - DESC plans to model the CT Plan in the updated candidate resource plans.
    - DESC will provide more details of the CT Plan its Short-Term Action Plan.

2021 IRP Update Inputs & Assumptions

- Solar ELCC
  - In Order No. 2020-832 DESC is to correct the incremental flexible solar PPA capacity value assumptions to reflect the ELCC value specific to the existing system penetration level of incremental flexible solar PV.
  - DESC applied that value in its modeling of PV resources in the 2020 Modified IRP.
  - DESC will use a similar approach in its modeling for the 2021 IRP Update.
  - Options for Stakeholder discussion:
    - Capacity Benefit Analysis would provide a summer and winter contribution to the reserve margin.
    - Summer and winter ELCC calculation is another option.

2021 IRP Update Inputs & Assumptions

- Portfolio Selection Criteria - Act No 62 Most Reasonable & Prudent Conditions
  - IRP must appropriately balance seven factors
    - **RESOURCE ADEQUACY***: Able to serve anticipated peak load & planning reserve margins
    - **COMPLIANCE***: Compliance with applicable state and federal environmental regulations
    - **COST**: Consumer affordability and least cost
    - **RELIABILITY**: Power supply reliability
    - **COMMODITY**: Commodity price risks
    - **DIVERSITY**: Diversity of generation supply
    - **OTHER**: Other foreseeable conditions that the Commission determines to be for the public interest

*All candidate resource plans will meet **Resource Adequacy** & **Compliance** factors

2021 IRP Update Inputs & Assumptions

- Risk Metrics
  - 40 Year Levelized Cost Net Present Value
  - 2049 CO2 (Tons Emitted)
  - 2049 Clean Energy (GWh)
  - Average Fuel Costs
  - Generation Diversity
  - Reliability
  - Mini-Max Regret
  - Cost Range

2021 IRP Update Inputs & Assumptions

Reliability Factor	Able to generate or become a load, shift energy, and complement renewables.
Energy Storage	The units have the ability to shift supplies of energy between high and low load periods which aids reliability.
Limited Energy Source	The unit is able to function as a source of energy whose output normalizes to 16 hours/day of full load production but has limited abilities to replace 24-hour resources.
Dispatchability	The unit will respond to directives from system operators regarding its status, output, and timing. The Dispatchability of intermittent resources is limited and so their score is subject to a deduction. They cannot be counted as firm and require additional reserves.
Operational Flexibility	The unit is able to cycle and ramp up and down with little or no adverse impact on fuel costs or physical damage to the unit. Deductions are made if the units have a minimum operating load below which it cannot be dispatched.
Coincident Peak Output	The unit has the ability to provide energy and capacity to meet customer requirements during the winter peak demand period.
AGC	The unit has the ability to be placed on Automatic Generation Control allowing its output to be ramped up or down automatically to respond immediately to changes on the system.
Fast Start	The unit can respond from an offline condition and serve load in less than 10 minutes.
Inertia (non-inverter)	The unit operates using large rotating machinery (turbines, shafts, stators, exciters, etc.) that provide an inertial energy reservoir or a sink to stabilize the system. The rotation of this mass of machinery (inertia) provides frequency support.
VAR support	The unit can be used to send VARs out onto the system or consume excess VARs and so can be used to control voltage.

2021 IRP Update Inputs & Assumptions

Reliability Factor	**Able to generate or become a load, shift energy, and complement renewables.**
Geographic Diversity	The unit can be located in diverse locations and is not restricted by fuel infrastructure.
Proximity to Load	The unit has a compact footprint and low impact outside of the fence. It can often be sited near load centers.
Synchronous Condensing	The unit can provide voltage support (VARS) even when not producing energy (synchronous condensing).
Black Start	The unit can be used in the first step to system restoration after an outage.

Updated reliability factors from Appendix A of the Joint Comments

Reliability Factors by Resource Type									
Unit Type	Coal Unit	Gas-fired Boiler	CC	Large Frame ICT	Aero ICT	Battery	Battery PPA	Flexible Solar	Solar PPA
Scale 1 - 4 used to convey both relative importance of each attribute and how well the resource provides that attribute									
Reliability Factor									
Energy Storage						1	1		
Energy Duration	4	4	4	4	4	1	1	1	1
Dispatchability	2	2	2	2	2	2	2		
Op Flexibility	1	1	2	2	3	2	2		
Coincident Peak Output	4	4	4	4	4	3	3		
Automatic Generation Control	2	3	4	2	2	3	3	1	1
Fast Start					1	1	1		
Inertia (non-inverter)	3	3	3	2	1				
VAR support	2	2	2	2	2	2	2	1	1
Geographic Diversity						1	1	1	1
Proximity to Load	1	1			1	1	1		
Synchronous Condensing					1				
Blackstart					2	1	1		
Total	19	20	21	18	23	18	18	4	4
Comparative Size*	6.0	1.0	5.5	5.2	1.3	1.0	1.0	1.0	1.0
Total Points	114	20	116	94	30	18	18	4	4

* Normalizes the comparison to standard value per 100MWs

Modified 2020 Integrated Resource Plan 70

Reliability Factors by Resource Type Scale 1 - 4 used to convey both relative importance of each attribute and how well the resource provides that attribute									
Unit Type	Coal Unit	Gas-fired Boiler	CC	Large Frame ICT	Aero ICT	Battery	Battery PPA	Flexible Solar	Solar PPA
Energy Storage						1	1		
Energy Duration	3	3	3	3	3	2	2	1	1
Dispatchability	2	2	2	2	2	2	2	2	
Op Flexibility	1	1	2	2	3	4	4		
Coincident Peak Output	4	4	4	4	4	3	3		
Automatic Generation	1	3	4	2	2	4	4	4	1
Fast Start					3	4	4		
Inertia (non-inverter)									
VAR Support	2	2	2	2	2	2	2	1	1
Geographic Diversity						1	1	1	1
Proximity to Load		1			1	1	1		
Synchronous Condensing					1				
Blackstart					1	1	1		
Total	13	16	17	15	22	25	25	9	4
Comparative Size*	6.0	1.0	5.5	5.2	1.3	1.0	1.0	1.0	1.0
Total Points	78	16	93.5	78	28.6	25	25	9	4

Designates a decrease in reliability factor
Designates an increase in reliability factor

*Normalizes the comparison to standard value per 100MWs

Source: Joint Comments on DESC's Modified 2020 IRP, Docket No. 2019-226-E, Pursuant to Order No. 2020-832, Appendix A

2021 IRP Update – Other Assumptions

Ordering Provision 7. DESC is directed to employ a reasonable levelized cost of saved energy (LCSE) which is comparable with industry standards in conducting its upcoming Market Potential Study and in developing future IRPs starting with the 2021 IRP Update.

- LCSE
  - As described in the 2019 Potential Study (page 26), DESC calculated the levelized cost of energy in accordance with industry standards for the demand side management programs.

  "The levelized cost of energy is the net present value of the full program costs divided by the net present value of the cumulative lifetime savings from all the measures from the program. On the other hand, the annual cost of energy is the sum of all program costs divided by the incremental program savings. This means that the levelized cost takes into account all savings from the program, as well as being in real dollars, while the annual cost is in actual dollars and only considers first-year savings."

  - The Commission approved the 2019 Potential Study in Order No. 2019-880 affirming that DESC used industry standards in calculating the levelized cost of energy.

2021 IRP Update – Other Assumptions

Ordering Provision 9. DESC is directed to use marginal line losses in the calculation of avoided costs and in the translation of energy savings from the Market Potential Study to energy savings in future IRP modeling beginning with the 2021 IRP Update.

- Marginal Line losses
  - As part of the 2019 Potential Study, and following analyses related to energy savings from the demand side management programs, DESC used the ***marginal line loss*** factor in order to calculate wholesale savings related to capacity (kW) and ***average line loss*** factor in order to calculate wholesale savings related to energy (kWh) (page 82 of the 2019 Potential Study).

  - DESC feels this is appropriate because the marginal line loss recognizes the additional line loss that occurs outside of normal operating times and is coincident with the peak. The average line loss factor was used for energy, because the savings occur across the year when line losses are lower than the marginal line loss factor. Inherit in the average line loss is the amount of savings that occurs during the peak and non-peak times.

2021 IRP Update – Other Assumptions

- Marginal Line losses (Continued)
  - Related to cost-effectiveness testing, one could apply the line loss factor to the avoided cost and then multiply by premise level savings in order to calculate the resulting benefits. However, DESC instead applies the appropriate line loss factor to the energy (average) and capacity (marginal) savings in order to accurately represent generation (wholesale) level savings and then multiplies by the avoided cost in order to calculate the resulting benefits. The benefit calculation results in the same number; however, through DESC's method one can ascertain both the generation (wholesale) and the premise (meter) level savings.

  - While DESC feels its method of applying marginal line loss factors to capacity savings and average line loss factors to energy savings is correct, for the purpose of providing IRP inputs DESC will recalculate the resulting energy savings for the low, medium, and high scenarios with this new line loss factor.

2021 IRP Update Inputs & Assumptions

- Load Forecast
  - DESC's 2020 Modified IRP filed February 19, 2021 incorporates DESC 2021 base Load Forecast.
  - DSM marginal line losses will be recalculated in the new Load Forecast per Order No. 2021-429.
  - DESC will include this topic in future stakeholder meetings to inform future IRPs.

- EE integration
  - DESC incorporates energy efficiency into the Load Forecast scenarios.
  - DESC will include this topic in future stakeholder meetings to inform future IRPs.

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #3

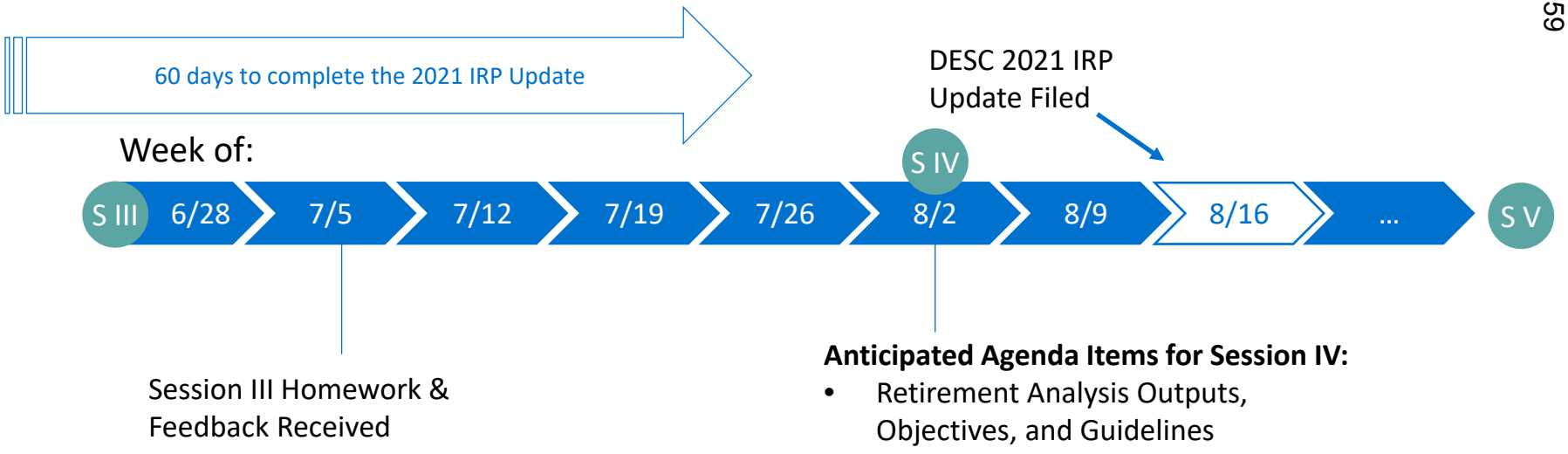
V. Homework for Session IV and Discussion

V. Homework for Session IV and Discussion

- Overview of Session III Homework
- *Discussion*

Setting expectations for Session IV

- The 2021 IRP Update is expected to be filed approximately 7 weeks from Session III
- Session IV will occur in approximately 5 weeks and focus on the Retirement Study
- Session V is anticipated in September and will focus on inputs to the 2022 IRP Update



Feedback Requested from Session III

- Agenda Feedback: Should DESC devote a session to reliability analysis and LOLE calculation as proposed by Stakeholders following Session II?
- Agenda Feedback: What topics would you like DESC to raise at future meetings?
- Retirement Analysis: DESC has provided a list of assumptions to be considered in the retirement analysis. In your view, is this consistent with the order and if not, what additional assumptions need be considered?
- Retirement Analysis: DESC is considering a consistent but limited set of technologies as replacement options for each of the retirement dates including CCs, CTs and storage. What 3 to 4 options do you suggest be considered (please recognize that we are evaluating the retirement dates only here not the optimal portfolio as in an IRP)?
- 2021 IRP Update Inputs: Is approach consistent with Order No. 2021-429, are there any gaps in the updates proposed by DESC?
- EE Integration: How should DSM modeled as a resource? Please provide examples of approaches.
- Solar ELCC: Does DESC's approach to measuring solar winter capacity contribution to the IRP make sense? What other approach or value would you recommend that DESC should adopt?
  - *Note that this question is repeated from Session II because some Stakeholders indicated that they had additional comments to provide on this topic in the last round of feedback.

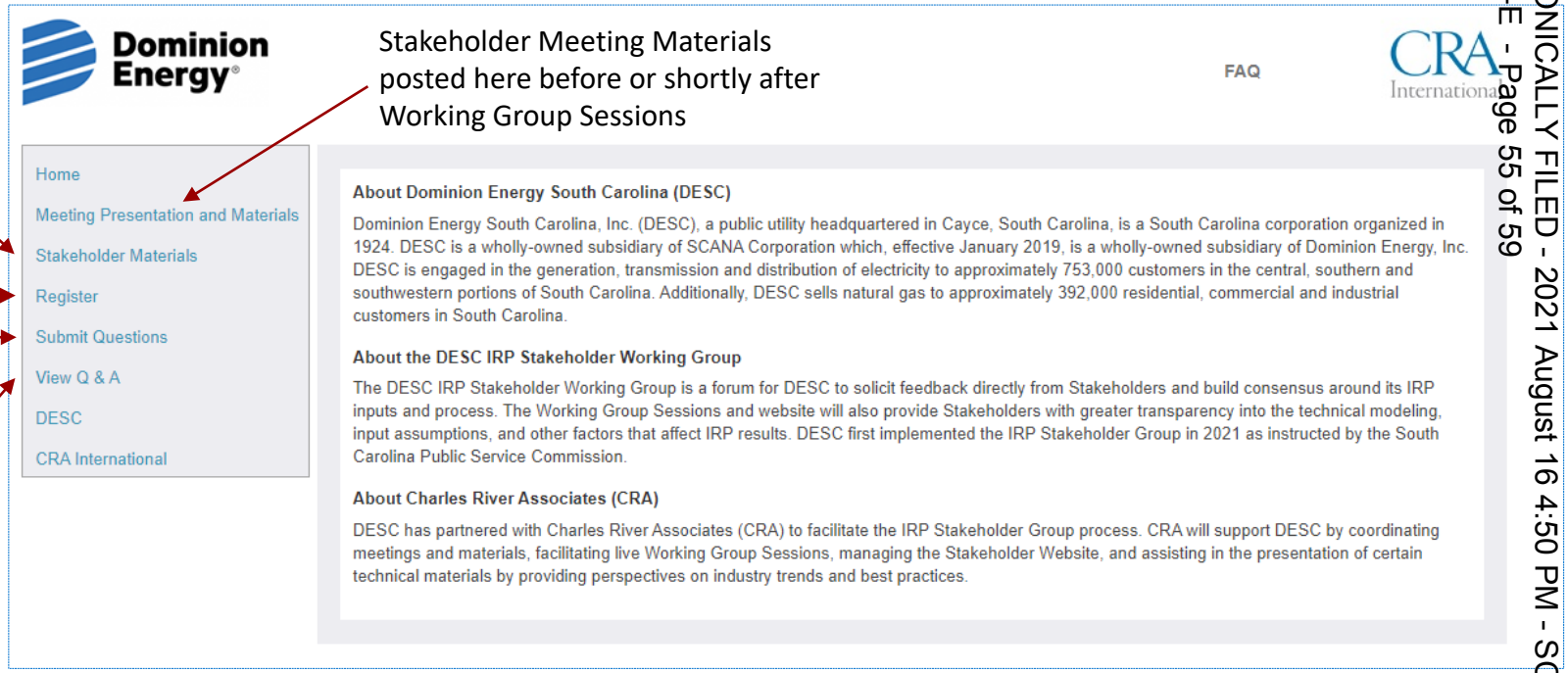
Discussion - Please “Raise Hand” in the Chat

Stakeholder Website Overview

Supplemental materials and QA support documents

Registered users can submit on-topic Questions to DESC

Published QA can be viewed by public



https://www.DESC-IRP-Stakeholder-Group.com

Email DESC-IRP-Group@crai.com with questions about the website or if you have content to share with the Stakeholder Group

Appendix

Review: Order No. 2020-832 Requirements

Topic Areas	2020	2021	2022	2023
Natural Gas	Re-run production cost modeling using the AEO low, reference, and high gas prices		Use a "wide but plausible" range of gas price projections from a public, credible source	
DSM	Consider 1% savings in '22, '23, and '24, and conduct rapid assessment of cost-effectiveness and achievability. Include results and action steps to complete evaluation of the cost-effectiveness and achievability of DSM portfolios savings ranging from 1% to 2%		Evaluate the cost-effectiveness and achievability of four levels of savings: 1.25%, 1.5%, 1.75%, and 2%. Consider substantive changes to the existing portfolio. Include new candidate resource plans including DSM and purchased power as options	Incorporate potential study findings in 2023 plus work with stakeholders to iterate portfolios with incentives and best practices to achieve modeled levels of DSM savings
Purchased Power	Use flexible **solar PPA** cost assumptions and model 400MW flexible Solar PPAs starting 2023 w/ 20-year prices: $34, $36, and $38.94/MWh. **Storage PPAs** - use NREL ATB's low storage costs (capital and fixed O&M)		Include additional candidate resource plans including DSM and purchased power in candidate resource plans and evaluated across multiple scenarios	
Solar PV	Assume integration costs of $0.96 / MWh for solar PV, until there's Commission-approved method to calculate it			
ICT	Use industry accepted ICT capital cost assumptions			
CO_2 Prices	Re-run production cost model using AEO High CO_2		Use "wide but plausible" zero/M/H CO_2 cost projections from AEO	
Peaking reserve margins			Include resource plans to meet full peaking reserve margin. Find what resources best meet the peaking increment	
Risk-adjusted metrics			Consider, with stakeholder input, use of more sophisticated risk-adjusted metrics (natural gas price risk, carbon price risk, load forecast risk)	
Coal Retirement			Incorporate the conclusions from the comprehensive coal retirement analysis called for in this Order	
Action Plans	3-year action plan with steps to implement the IRP			

Review: Order No. 2020-832 Requirements

Topic Areas	2020	2021	2022
Modeling Software			Implement capacity expansion software with input from stakeholders. Software must meet transparency requirements. Avail inputs and outputs, assumptions, post-processing sheets, and the model annual
Required Resource Plans	Include analysis and comparison of all candidate resource plans using simple quantitative risk metrics (cost ranges and minimax regret score)		Consider diversity of generation supply, and propose candidate resource plans designed to further diversify. Include "contribution to diversity supply" in the evaluation of candidate resource plans
	Include more candidate resource plans that deploy renewables (RP7-A and RP7-B). In 2021, keep quantitative risk metrics from 2020 and update to latest data		
ITC Assumptions	Storage PPAs use the same 22% ITC safe harbor assumptions employed for PV PPAs		
Resource Cost Assumptions	Two different escalation rates implemented incorrectly - correct the error		
Resource Performance Assumptions	Correct the incremental flexible solar PPA capacity value assumptions to the existing system penetration level of incremental flexible solar PV		
	Include recent generator performance data (e.g. forced outage rate). Include storm and hurricane-related outage reporting		
Load Forecast Assumptions			Develop a wide range of load forecasts. Cost modeling capture each plan's capabilities to adapt to load that diverges from base forecast
Stakeholder Process		Report on Stakeholders. Semi-annual updates	Negotiate discounted, licensing fee that permits intervenors to perform modeling. Absorb the cost
State and Federal Regulations	Include more analysis how environmental regulations affect generation units and resource choices		
Rate and Bill Impacts	Calculate the rate and bill impacts of portfolios, rather than just a levelized NPV of revenue requirements		

Review: Act No. 62 - Most Reasonable & Prudent Conditions

Commission is directed to consider…whether the IRP appropriately balances seven factors

- **RESOURCE ADEQUACY***: Able to serve anticipated peak load & planning reserve margins
- **COMPLIANCE***: Compliance with applicable state and federal environmental regulations
- **COST**: Consumer affordability and least cost
- **RELIABILITY**: Power supply reliability
- **COMMODITY**: Commodity price risks
- **DIVERSITY**: Diversity of generation supply
- **OTHER**: Other foreseeable conditions that the Commission determines to be for the public interest

Additional Order Requirements:

- Evaluate plans against all scenarios
- Evaluate "Cost Range" (COSTS)
- Evaluate "Minimax Regret" (PLAN DIVERSITY)

*All plans meet **Resource Adequacy** & **Compliance** factors